

DOCUMENT A00871

# **NORTHERN LONG-EARED BAT ACOUSTIC SURVEY REPORT**

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September 22, 2021

**Attention: Tim Dexter**

Fish & Wildlife Program Coordinator  
Massachusetts Department of Transportation – Highway Division  
Ten Park Plaza, Room 4260  
Boston, MA 02116-3973

Dear Tim,

Project	Northern Long-eared Bat (NLEB) Presence/Absence Survey
MassDOT Project #	608929
Town	Wilmington, Massachusetts
Surveyor Name/Firm	Stantec Consulting Services Inc.
Detector Operation Dates	August 2–3 and 3–4, 2021
Survey Results	<b>NLEB NOT DETECTED</b>

The attached report contains the results of the Massachusetts Department of Transportation (MassDOT) northern long-eared bat (*Myotis septentrionalis*; NLEB) summer presence/absence survey performed for a bridge replacement project on Butters Row over the Massachusetts Bay Transportation Authority railway (MassDOT #608929) in Wilmington, Massachusetts. Acoustic detectors deployed by Stantec Consulting Services Inc. did not detect the presence of NLEB. Automated U.S. Fish and Wildlife Service-approved software (Kaleidoscope Pro version 5.4.1; KPro) did not identify NLEB or indicate presence based on nightly maximum likelihood estimate scores, and presence of NLEB was not confirmed based on our qualitative assessment. Four bat passes were autoclassified by KPro as the state-endangered tricolored bat (*Perimyotis subflavus*), and presence was confirmed during visual vetting.

Regards,

**Stantec Consulting Services Inc.**



**Alex Pries**  
Project Manager

Phone: (603) 260-7434  
Fax: (207) 729-2715  
Alex.Pries@stantec.com

Attachment: NLEB Survey Report for Wilmington2 608929

To: Tim Dexter, Fish and Wildlife Program Coordinator From: Alex Pries  
 Massachusetts Department of Transportation Auburn, New Hampshire Office  
 File: 179410724 Date: September 22, 2021

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**Reference: Bridge Replacement Project on Butters Row over the MBTA in Wilmington,  
 Massachusetts – Northern Long-eared Bat Acoustic Survey Report**

## **INTRODUCTION**

The Massachusetts Department of Transportation (MassDOT) retained Stantec Consulting Services Inc. (Stantec) to conduct an acoustic survey for the presence or probable absence of populations of the federally threatened and state-listed endangered northern long-eared bat (*Myotis septentrionalis*; NLEB) along a bridge replacement project on Butters Row over the Massachusetts Bay Transportation Authority (MBTA) railway in Wilmington, Massachusetts (Project). The Project includes potential tree clearing along 0.16 kilometers (km) of forested habitat (Figure 1). The purpose of the survey was to determine if this species is using these forested areas at the Project during the 2021 summer maternity season. The survey was conducted according to methods outlined in the U.S. Fish and Wildlife Service's (USFWS) March 2020 Range-wide Indiana Bat Summer Survey Guidelines (USFWS Guidelines).<sup>1</sup> No additional updates were made to the USFWS Guidelines for the 2021 survey season. Stantec provided a Study Plan (Appendix A) for this acoustic survey to MassDOT on June 30, 2021, and USFWS on July 5, 2021, based on USFWS Guidelines. After the Study Plan was approved by USFWS on July 19, 2021, Stantec conducted surveys on August 2 and 3, 2021. The USFWS Guidelines identified a survey window of May 15 to August 15 for acoustic surveys. This memorandum summarizes methods and results of the acoustic bat survey for the Project.

## **METHODS**

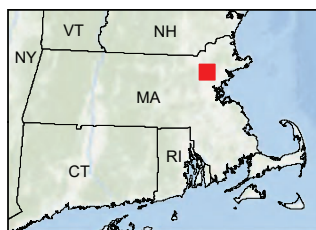
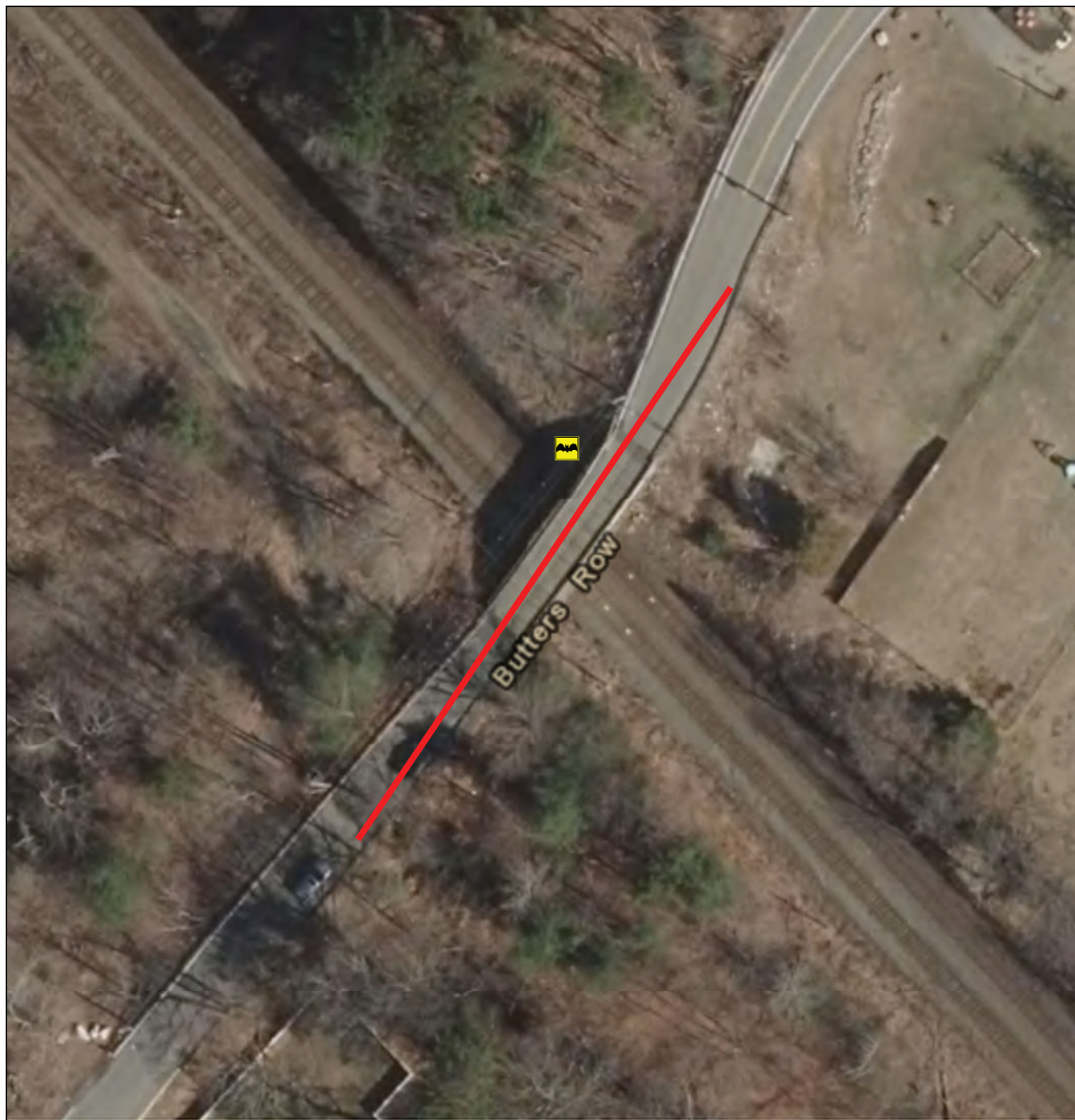
### **FIELD SURVEY**



Surveys were conducted according to the methods outlined in the Study Plan (Appendix A). The USFWS Guidelines specify survey effort for acoustic surveys based either on an area method or a linear method. Stantec determined that the linear method was appropriate for this Project given the linear nature of potential tree clearing limits. Per the survey efforts outlined in the USFWS Guidelines: Phase 2 Acoustic Surveys for linear projects, at least two detector-nights per km of suitable summer habitat are required for the Project. For the purposes of this survey, we have conservatively assumed that all forested areas immediately adjacent to the Project provide potential roost habitat for NLEB (e.g., suitable summer habitat) and may potentially be cleared during project construction. Accordingly, Stantec conducted two detector-nights (two detector-nights per km) of acoustic surveys as approved in the Study Plan.

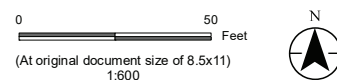
Stantec identified one detector location based on review of aerial imagery during a desktop analysis and land permission access to the MassDOT right-of-way associated with the Project. Stantec biologists minimally adjusted the survey site in the field according to USFWS Guidelines, positioning the detector in a location that could be suitable as potential NLEB foraging habitat. The detector location was positioned along a forested edge of the bridge location (Figure 1). We recorded the location of the survey site using the Survey123 mobile app on an iPhone, photographed the site (Appendix B), and recorded habitat information on Stantec field datasheets and the USFWS Guidelines Appendix A Phase 1 Summer Habitat Assessments datasheet (Appendix C).

<sup>1</sup> The USFWS has indicated that the USFWS Guidelines are to be used to detect presence of NLEB as well as Indiana bats. Available at <https://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html>

V:\1956\active\Task Owner and other Non-BC\1956\_jobs\179410724\_MassDOT\03\_data\gis\_cad\GIS\mxd\AvianBat\179410724\_DetectorsStudyPlan.mxd Revised: 2021-06-25 By: gearpenter



- Legend**
-  Acoustic Survey Location
  -  Project Area



**Project Location**  
Wilmington, Massachusetts

Prepared by GC on 2021-06-25  
Reviewed by LJ on 2021-06-25

**Client/Project**  
Massachusetts Department of Transportation  
Long-eared Bat Acoustic Survey

179410724

**Figure No.**  
**1**

## Northern Long-eared Bat Acoustic Survey Detector Location Map

**Notes**

1. Coordinate System: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet
2. Data Sources: MassDOT, Stantec
3. Background: Massachusetts 2019 USGS Color Orthoimagery

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Stantec used a full-spectrum acoustic bat detector (Wildlife Acoustics© SM4BAT-FS) for the survey, inspecting the detector and ensuring the microphone met manufacturer calibration standards before deployment. The detector was fitted with a SMM-U1 ultrasonic omnidirectional microphone and deployed in an area without vegetation or with minimal vegetation within 10 meters (m) and at least 3 m away from obstructions in any direction. The detector was mounted with the microphone approximately 3 m above ground level and oriented horizontally to the ground to sample an optimal volume of air space in accordance with the USFWS Guidelines. The audio and data storage settings on the detector were set according to defaults recommended by the manufacturer (e.g., detectors will operate in “triggered.wav” mode using default trigger threshold settings). The detector was set to record from 30 minutes before sunset until 30 minutes after sunrise and was powered with alkaline batteries.

## DATA ANALYSIS

Although acoustic surveys focused on detecting NLEB, bat detectors are designed to detect all bats vocalizing in the vicinity of the detectors. Therefore, additional listed bat species can be detected, including eastern small-footed bat (*Myotis leibii*; state-listed endangered), little brown bat (*Myotis lucifugus*; state-listed endangered), and tricolored bat (*Perimyotis subflavus*; state-listed endangered). Though the federally endangered Indiana bat (*Myotis sodalis*) is listed as endangered in Massachusetts, the state occurs outside the known range of this species and Stantec does not believe that this species occurs at the Project. Therefore, Indiana bat was not included in acoustic analysis.

Stantec performed an initial coarse visual analysis of data to confirm that high frequency bats were recorded. Data were then converted to zero-crossing format and analyzed using Kaleidoscope Pro Software version 5.4.1 (KPro; classifier version 5.4.0), using a “0” sensitivity setting and selecting the appropriate species list for the Massachusetts region (excluding Indiana bat). This analysis method has been approved by the USFWS as suitable for analyzing full-spectrum bat data collected by SM4 units once the data have been converted to zero-crossing format.

KPro analyzes each acoustic file and assigns it a bat species identification if the program determines it contains a bat call (pass) opposed to acoustic static. KPro also assigns a maximum likelihood estimate (MLE) to each species identified, at each detector site, for each night surveyed. According to the USFWS Guidelines, presence or probable absence of NLEB is based on the species’ MLE generated by KPro for each detector site for each night surveyed. An MLE of less than 0.05 indicates probable presence and an MLE greater than 0.05 indicates probable absence of that species at that detector site for that night.

Stantec visually vetted all files recorded on nights with probable NLEB presence (MLE of less than 0.05) to evaluate the plausibility of NLEB presence on those nights. We also reviewed all high frequency files identified as any state-listed bat species by the program to evaluate the plausibility of additional bat species of interest.

## RESULTS

### HABITAT SURVEY

The Project area includes a bridge over a railroad surrounded by residential and commercial areas interspersed with fragmented stretches of forest (Figure 1). The forested habitat consists of hardwood forest dominated by red maple (*Acer rubrum*), bigtooth aspen (*Populus grandidentata*), and northern red oak (*Quercus rubra*). Many potential bat flight and foraging corridors exist through the surrounding mixed commercial or residential development.



## FIELD SURVEY

Stantec deployed the acoustic detector on August 2, 2021, and surveys took place during the nights of August 2 and 3. Stantec monitored weather conditions at weather station KMAWILMI49 (Weather Underground, located approximately 1.3 miles south-southwest of the Project) after each night and confirmed that weather met the parameters outlined in the USFWS Guidelines during the first 5 hours surveyed after sunset:

- Temperatures exceeded 50°F;
- No precipitation or fog for 30 minutes or more; and
- Sustained wind speeds did not exceed 9 miles/hour for 30 minutes or more.

The detector was inspected in the field on August 4, 2021, to confirm proper operation during two nights of deployment. The detector operated successfully during both nights of survey and was retrieved.

## ACOUSTIC ANALYSIS

Coarse visual analysis confirmed presence of high-frequency bat passes at the site. Analysis with KPro software did not identify any passes as NLEB or indicate presence of NLEB based on nightly MLE scores. Visual QA/QC, performed by Laura Berube and Dr. Trevor Peterson (see resumes in Appendix D) indicated no presence of NLEB (Table 1).

KPro did not identify any passes as state-endangered eastern small-footed bat or little brown bat or indicate presence of either species at the Project based on nightly MLE scores. Visual QA/QC did not confirm presence for either species (Table 1).

KPro identified four passes as state-endangered tricolored bat but did not indicate presence at the Project based on nightly MLE scores. Visual QA/QC confirmed presence of this species at the Project (Table 1).

Additional species recorded at the Project included big brown bat, silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*), and eastern red bat (*Lasiurus borealis*). Overall, big brown bats accounted for most recorded bat activity, followed by hoary bats and eastern red bats.

See Appendix E for examples of bat passes documented at the Project. Original full-spectrum and converted zero-crossing data files have been archived electronically and can be made available upon request. We have populated and included the USFWS R5 Bat Reporting Form and the 2021\_MassDOT\_Batsurvey\_Consultant shapefile as electronic attachments.

**Table 1. Acoustic analysis results for state- and/or federally listed bat species based on KPro software and visual QA/QC for acoustic surveys for a bridge replacement project on Butters Row over the MBTA in Wilmington, Massachusetts.**

Species	Night	KPro Analysis	Visual QA/QC Notes
		# Passes (Nightly MLE Score)	
northern long-eared bat	2-Aug	0 (1.00)	No passes/No presence
	3-Aug	0 (1.00)	No passes/No presence
eastern small-footed bat	2-Aug	0 (1.00)	No passes/No presence
	3-Aug	0 (1.00)	No passes/No presence
little brown bat	2-Aug	0 (1.00)	No passes/No presence
	3-Aug	0 (1.00)	No passes/No presence
tricolored bat	2-Aug	0 (1.00)	No passes/No presence
	3-Aug	4 (0.87)	Presence confirmed based on visual QA/QC

## CONCLUSIONS

Acoustic surveys for the Project were conducted according to requirements outlined by the USFWS Guidelines and the approved Study Plan submitted to the USFWS and MassDOT prior to fieldwork. NLEB was not detected during the survey or confirmed during visual vetting, indicating probable absence of maternity colonies of the species at the Project during the 2021 field season. Tricolored bat presence was documented at the Project based on autoclassification, and this species was then confirmed during visual vetting. Bat activity consisted of primarily of big brown bats, hoary bats, and eastern red bats.



**Stantec Consulting Services Inc.**



**Alex Pries**  
Project Manager

Phone: (603) 260-7434  
Fax: (207) 729-2715  
Alex.Pries@ Stantec.com

Attachments:

- APPENDIX A Study Plan
- APPENDIX B Acoustic Detector Photographs
- APPENDIX C Habitat Assessment
- APPENDIX D Resumes of Laura Berube and Trevor Peterson
- APPENDIX E Screenshots of Bat Passes
- USFWS\_bat\_spreadsheet\_NortheasternUS\_2020\_Wilmington2.xlsx (electronic file)
- Acoustic\_Survey\_Locations\_Stantec\_20210922\_STN.zip (electronic file)

## **APPENDIX A Study Plan**



**2021 MassDOT Northern Long-Eared  
Bat Acoustic Surveys Study Plan**

July 5, 2021

Prepared for:

Massachusetts Department of  
Transportation  
10 Park Plaza, Room 4260  
Boston, MA 02116

Prepared by:

Stantec Consulting Services Inc.  
30 Park Drive  
Topsham, ME 04086

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## 1.0 INTRODUCTION

Massachusetts Department of Transportation (MassDOT) has retained Stantec Consulting Services Inc. (Stantec) to conduct acoustic surveys for the presence of northern long-eared bats (*Myotis septentrionalis*; NLEB) along the following linear transportation improvement projects requiring tree clearing:

- Lynn, MA: Reconstruction on Route 129 from Great Woods Road to Wyoma Square
- Leominster, MA 1: Reconstruction/Rehabilitation on Route 12 (Central Street)
- Leominster, MA 2: Viscoloid Avenue Improvements (SRTS)
- Wilmington, MA 1: Bridge Replacement, W-38-002 (Route 38) Main Street over B&M Railroad
- Wilmington, MA 2: Bridge Replacement, W-38-003, Butters Row over MBTA
- South Hadley, MA: Resurfacing and Related Work on Route 116
- Mendon, MA: Resurfacing and Related Work on Route 16
- Amherst-Belchertown, MA: Norwottuck Rail Trail Resurfacing
- Lancaster, MA: Intersection Improvements on Route 117/Route 70 AT Lunenburg Road and Route 117/Route 70 at Main Street
- Danvers, MA: Resurfacing and Related Work on Route 114
- Uxbridge, MA: Superstructure Replacement, U-02-052, Route 146 Ramp over Emerson Brook
- Attleboro, MA: Bridge Replacement, A-16-062(3UL), Interstate 295 Ramp over Ten Mile River
- Abington-Brockton, MA: Pedestrian and Bicycle Improvements on Route 123

This study plan describes the methods and level of effort for the acoustic survey to be conducted at each of the 13 project areas to determine the presence or probable absence of breeding populations of NLEB at each area using the methods described in the U.S. Fish and Wildlife Service's (USFWS) March 2020 Range-wide Indiana Bat Summer Survey Guidelines (USFWS Guidelines)<sup>1,2</sup>. Although acoustic surveys will focus on detecting NLEB, bat detectors are designed to detect all bats vocalizing in the vicinity of the detectors. Therefore, additional listed bat species may be detected during surveys, including eastern small-footed bat (*Myotis leibii*; state-listed endangered), little brown bat (*M. lucifugus*; state-listed endangered), and tricolored bat (*Perimyotis subflavus*; state-listed endangered). Though the federally endangered Indiana bat (*Myotis sodalis*) is listed as endangered in Massachusetts, the state occurs outside the known range of this species. Therefore, Stantec does not believe that this species occurs

<sup>1</sup> United States Fish and Wildlife Service (USFWS). 2020. Range-Wide Indiana Bat Survey Guidelines. March 2020.

<sup>2</sup> The USFWS has indicated that the USFWS Guidelines are to be used to detect presence of northern long-eared bats as well as Indiana bats.

within the study areas and Indiana bat will not be included in acoustic analysis at these projects. The goal of the study is to assess if NLEB are utilizing potential habitat along each project location during the 2021 summer maternity season.

In addition, MassDOT has requested Stantec provide independent review and concurrence for a suite of projects where no potential habitat for NLEB is believed to be present. The results of Stantec's review and conclusions for these locations are provided below. Agreement from the USFWS that these locations do not require any further field surveys is being sought as part of agency approval of this study plan.

## 2.0 SURVEY METHODS

### 2.1 DESKTOP ANALYSIS

Stantec conducted a desktop review of each project location to estimate the need and level of effort for acoustic surveys. As a subset of the overall list of projects (including those listed above), Stantec was provided with projects where MassDOT's initial project review suggested potential habitat for NLEB was not present. Stantec was asked to review these projections and provide confirmation with MassDOT's conclusions. Stantec has identified five project locations where desktop review alone is sufficient and acoustic surveys are not required. The locations are described below along with a rationale for why additional field surveys are not required. Figures for these locations are also included in Appendix A (Figures 1–6).

- Essex, MA: Route 133 Bridge over the Essex River: For this project, MassDOT requested that Stantec complete a bridge inspection only for potential bat habitat. Additionally, it is assumed that tree clearing will not be required. *As a result, acoustic surveys are not proposed.*
- Watertown, MA: Rehabilitation of Mount Auburn Street (Route 16): This project site is located in an urban environment. The project site contains many trees on residential parcels, though it lacks contiguous parcels of forested habitat suitable for summer roosting. *As a result, acoustic surveys are not proposed.*
- Salem, MA: Bridge Replacement, S-01-001 (ST-114) North Street over North River: This project site is located in a non-forested urban environment. Only one large tree is present; therefore, it is determined that no suitable forested roosting habitat exists at this site. *As a result, acoustic surveys are not proposed.*
- Everett, MA: Reconstruction of Ferry Street, Chelsea Street, Elm Street, and Broadway: This project site is located in an urban environment. The project site contains many trees on residential parcels, though it lacks contiguous parcels of forested habitat suitable for summer roosting. *As a result, acoustic surveys are not proposed.*
- Boston, MA: Superstructure replacement, S-17-027, Mystic Avenue over Orange and MBTA/BMRR: This project site is located in a non-forested urban environment adjacent to buildings, parking lots, and a major highway. It contains few trees and is without suitable forested roosting habitat. *As a result, acoustic surveys are not proposed.*



- Boston – Chelsea, MA: Repairs on Tobin Bridge, B-16-017: This project site is located in a non-forested urban environment adjacent to many commercial buildings and parking lots. Though it contains small patches of trees on the southwestern portion, it lacks contiguous forested habitat suitable for summer roosting. *As a result, acoustic surveys are not proposed.*

## 2.2 FIELD SURVEYS

Stantec will conduct the surveys at each study area within the USFWS approved survey dates (15 May–15 August) in 2021. Per the minimum survey efforts outlined in the USFWS Guidelines: Phase 2 Acoustic Surveys for linear projects, two detector-nights per kilometer (km) of suitable summer habitat that may be impacted are required for each study area. Finally, for the purposes of this study plan, Stantec has conservatively assumed that non-excluded forested areas immediately adjacent to each linear area provide potential roost habitat for northern long-eared bats (suitable summer habitat) and may potentially be cleared during project construction. Therefore, Stantec has determined the following level of effort for each project based on the amount of linear tree clearing:

### Boston Area Sites:

- Lynn, MA: (1.13 km of potential tree clearing): 4 detector-nights (2 detectors deployed for 2 nights each)
- Wilmington, MA 1: W-38-002 over Main Street: (0.16 km of potential tree clearing): 2 detector-nights (1 detector deployed for 2 nights)
- Wilmington, MA 2: W-38-003, Butters Row: (0.16 km of potential tree clearing): 2 detector-nights (1 detector deployed for 2 nights)
- Uxbridge, MA: (0.05 km of potential tree clearing): 2 detector-nights (1 detector deployed for 2 nights)
- Mendon, MA: (2.97 km of potential tree clearing): 6 detector-nights (3 detectors deployed for 2 nights each)
- Danvers, MA: (2.6 km of potential tree clearing); 6 detector-nights (3 detectors deployed for 2 nights each)
- Attleboro, MA: (0.21 km of potential tree clearing): 2 detector-nights (1 detector deployed for 2 nights)
- Abington, MA: (3.9 km of potential tree clearing): 8 detector-nights (4 detectors deployed for 2 nights each)

### Central Massachusetts Sites:

- Lancaster, MA: (2.18 km of potential tree clearing): 6 detector-nights (3 detectors deployed for 2 nights each)
- Leominster, MA 1: Route 12 (Central Street): (4.11 km of potential tree clearing): 10 detector-nights (5 detectors deployed for 2 nights each)
- Leominster, MA 2: Viscoloid Avenue: (1.24 km of potential tree clearing): 4 detector-nights (2 detectors deployed for 2 nights each)

- South Hadley, MA: (1.96 km of potential tree clearing): 4 detector-nights (2 detectors deployed for 2 nights each)
- Amherst, MA: (2.4 km of potential tree clearing): 6 detector-nights (3 detectors deployed for 2 nights each)

Based on this proposed level of effort, Stantec will deploy a total of 16 detectors (32 detector-nights) at Boston-area sites and 15 detectors (30 detector-nights) at Central Massachusetts sites. Biologists will complete initial deployment in 2 days per site group (Days 1 and 2). Biologists will then retrieve all detectors over the course of 2 days per site group (Days 3 and 4) upon meeting the USFWS-required number of detector-nights under suitable weather conditions. This strategy of detector mobilization and demobilization assumes that nightly weather conditions remain appropriate during each night of survey according to USFWS Guidelines. If weather conditions do not meet USFWS Guidelines (e.g., there is rain, excessive wind, and/or cold temperatures), additional day(s) will be required.

Stantec will use full-spectrum (e.g., Wildlife Acoustics© SM4) acoustic bat detectors for the surveys. Each detector will be fitted with an SMM-U2 ultrasonic omnidirectional microphone. Stantec will deploy detectors according to the criteria in the USFWS Guidelines, positioning detectors in potential flight corridors that could provide suitable northern long-eared bat foraging habitat. As USFWS Guidelines recommend, microphones will be located in areas without vegetation or with minimal vegetation within 10 meters (m) of the microphone, obstructions will be located at least 3 m away from microphones in any direction, and detectors will be placed at least 200 m apart.

Based on review of aerial imagery during the initial desktop analysis and assuming access to the right-of-way (ROW) associated with each area, Stantec has identified proposed detector locations for each project (Appendix A; Figures 1–19). The proposed locations along the edge of the ROW and adjacent to tree clearing areas are spread out across each area to target either large segments of forest or forested areas near a wetland, field, or bridge. Final detector deployment will be determined by the biologist in the field and is also subject to landowner permission and access. In areas without landowner permission or suitable access, final detector placement will be in the closest appropriate location within a town, municipal, or state ROW depending on the project. Final detector locations will also be based on a field assessment and following criteria in the USFWS Guidelines. Stantec will record coordinates of the final detector locations using a GPS unit, document the approximate accuracy of the location, and photograph each detector so as to show scale (e.g., include a vehicle or person in the photo) and the surrounding habitat and the “detector-view.” For each detector site, Stantec will document relevant deployment and habitat information on a Stantec field datasheet and on the USFWS Guidelines Appendix A Phase 1 Summer Habitat Assessments datasheet (Appendix B).

Stantec will mount each detector so that the microphone is approximately 3 m above ground level and oriented horizontally to the ground to sample an optimal volume of air space in accordance with the USFWS Guidelines. Stantec will set the audio and data storage settings on each detector according to defaults recommended by the manufacturer (e.g., detectors will operate in “triggered .wav” mode using default trigger threshold settings recommended by the manufacturer). Stantec will program each detector to record from 30 minutes before sunset until 30 minutes after sunrise and will power each detector with alkaline batteries.

Stantec will leave detectors in place at each survey site until at least 2 calendar nights have been successfully surveyed during weather conditions that meet the parameters outlined in the USFWS Guidelines:

- Temperatures remain above 50° F during the first 5 hours of each survey night;
- Precipitation/fog persists for no more than 30 minutes during the first 5 hours of each survey night; and
- Sustained wind speeds do not exceed 9 miles/hour for 30 minutes or more during the first 5 hours of each survey night.

Stantec will verify weather conditions by reviewing hourly data recorded at the nearest weather station to each detector site, accessed online via Weather Underground ([www.wunderground.com](http://www.wunderground.com)). Stantec will record the weather station ID for each station used on the corresponding field datasheet. Following the first two weather-appropriate nights of data collection, Stantec will inspect each detector as soon as practicable in the field to confirm that each operated for 2 nights (i.e., check battery voltage, verify presence of recorded files, and view system status log files). Once confirmed, Stantec will remove the detectors from the field. Stantec will analyze only those data from the first 2 nights that meet the weather criteria.

### 3.0 ANALYSIS

Stantec bat biologists will perform a coarse visual analysis of the data to confirm that high frequency bat calls were recorded; if so, Stantec will then analyze data using Kaleidoscope Pro Software version 5.4.1 (or newer; Kaleidoscope), with classifier version 5.4.0 using a “0” sensitivity setting and by selecting for the Massachusetts region. This analysis method has been approved by the USFWS as suitable for analyzing full-spectrum bat data collected by SM4 units once the data have been converted to zero-crossing format. Stantec will base presence or probable absence of NLEB on the maximum likelihood estimate (MLE) generated by Kaleidoscope for each night. An MLE of less than 0.05 indicates probable presence and an MLE greater than 0.05 indicates probable absence. Original full-spectrum and converted zero-crossing data files will be archived electronically and made available upon request.

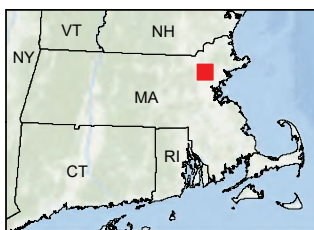
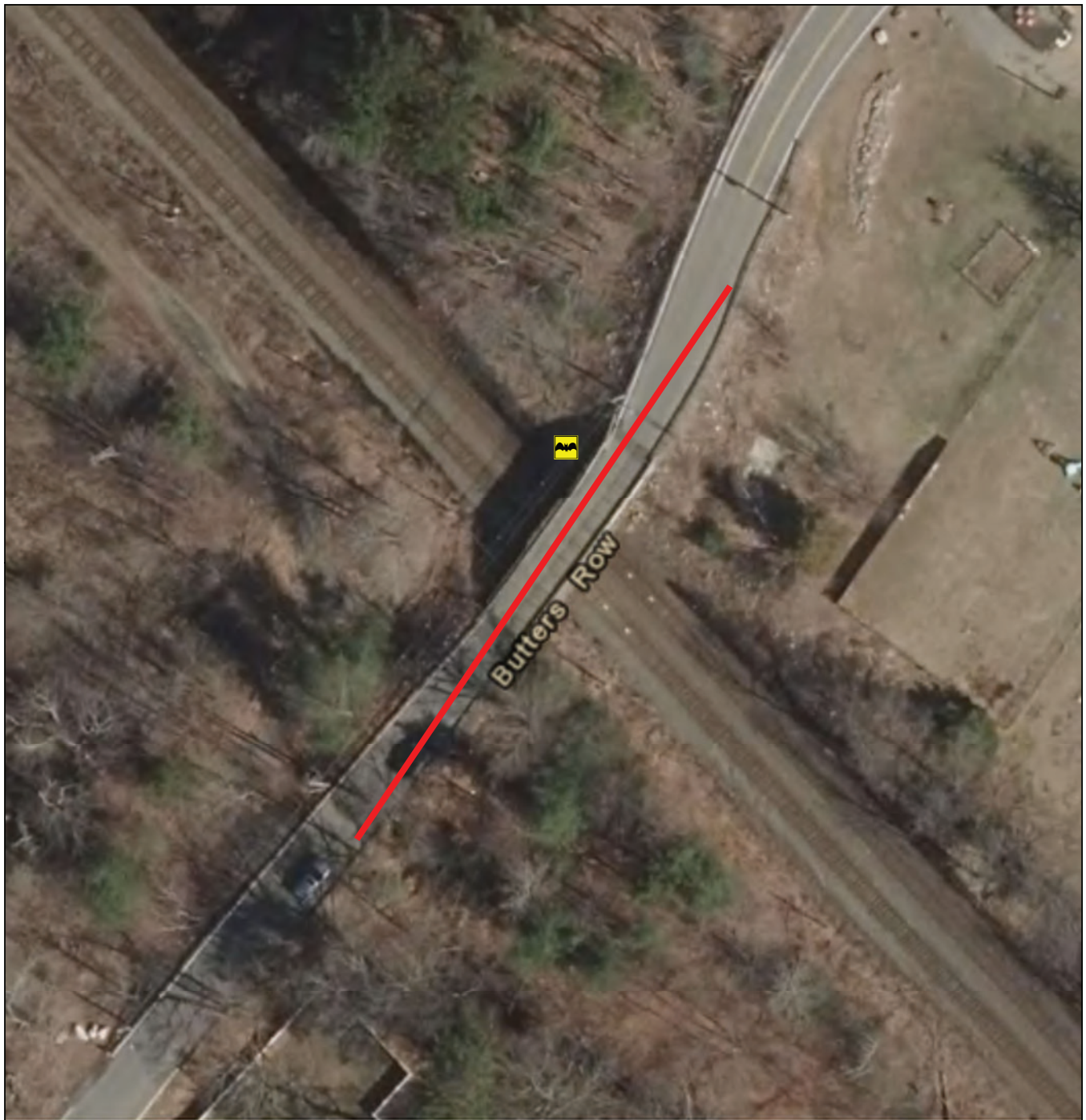
Stantec will manually inspect each file recorded for each detector site/night that Kaleidoscope calculates probable presence (an MLE of less than 0.05) for NLEB. Stantec will also visually inspect each high frequency call sequence recorded by detectors, thereby manually vetting all high frequency call identification determinations (or lack of identification) made by Kaleidoscope. Though acoustic surveys will primarily focus on detecting NLEB and other high frequency species, calls from all bat species will be analyzed by the software and manually inspected. Stantec biologists with relevant experience and training in acoustic bat identification will conduct the manual vetting. Credentials and experience of biologists performing the manual vetting will be indicated in the survey report and are included in Appendix C.



## 4.0 REPORTING

As requested by MassDOT, Stantec will prepare a single report for each project area describing the methods and results of the surveys as soon as possible after field work to ensure MassDOT meets their targeted transmittal to USFWS in late fall 2021. Each report will include completed Stantec and USFWS datasheets for the detector sites, maps showing the locations of each detector site, photos of the detector setups, screenshots of representative listed bat species' calls identified during analysis, tables summarizing the output from the Kaleidoscope identification software for all species identified, results of manual vetting, the resume of the biologist who conducted the manual vetting, the USFWS R5 Bat Reporting Form, and any other information required by the USFWS Guidelines. Associated Geographic Information System (GIS) data, original acoustic data, status or log files, and software output will be retained and made available upon request. Stantec will also provide MassDOT with the results of the survey in excel format based on the 2021 MassDOT Bat Survey Consultant format. Additionally, Stantec will format acoustic data into a template suitable for inclusion into the North American Bat Monitoring Program database.

## **APPENDIX A PROPOSED SURVEY LOCATION MAPS**

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- Legend**
-  Proposed Acoustic Survey Location
  -  Project Area

0 50 Feet  
(At original document size of 8.5x11)  
1:600



*Project Location*  
Wilmington, Massachusetts

Prepared by GC on 2021-06-25  
Reviewed by LJ on 2021-06-25

*Client/Project*  
Massachusetts Department of Transportation  
Long-eared Bat Acoustic Survey

179410724

*Figure No.*  
**9**

*Title*  
**Northern Long-eared Bat Acoustic Survey  
Proposed Location – Wilmington 2**

**Notes**  
1. Coordinate System: NAD 1983 StatePlane  
Massachusetts Mainland FIPS 2001 Feet  
2. Data Sources: MassDOT, Stantec  
3. Background: Massachusetts 2019 USGS Color  
Orthoimagery

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.



**APPENDIX B   STANTEC NLEB BAT PRESENCE/ABSENCE  
ACOUSTIC SURVEY DATASHEET AND USFWS  
PHASE 1 SUMMER HABITAT ASSESSMENTS  
DATASHEET**

# Stantec Ground-Based Acoustic Bat Detector Datasheet

Site ID:	Project Number:		Project Name:			
	State:	County:		Acoustic Survey Type		
Site Selector:	Lat:	Long:		Summer Acoustic		
Deployer:	Notes:					
Date Deployed:						
Deploy Duration:						
Detector #:						
<b>Detector Setup</b>						
Detector Make:	Detector Model:		Dist to Obstruct (m):			
Microphone Model:	Directionality:		Mic Height (AGL; m):			
Weatherproofing:	Mic Angle:		Call Data Type:			
Mic Direction (deg):	In-Field Calibration:			Notes:		
<b>HABITAT DESCRIPTION</b>						
<u>VEGETATION CHARACTERISTICS</u>				<u>STREAM CHARACTERISTICS</u>		
Habitat Type: Canopy Closure (%): Habitat Description:				Est. Distance to Water Source (m):		
				Type of Water:		
				<b>Detector Startup Notes:</b>  		
<b>Detector Startup:</b> Card In A: Card In B: Memory A: Memory B: Battery: Temperature: Mic 0: Cal Ch 0: Going to Sleep Until:						
Habitat Use:						
Habitat Notes:						
Additional Site Notes:						

USFWS accepted answers:

Mic Angle: 0 = parallel to ground, 45 = angled up, 90 = straight up, 315 = angled down, 270 = pointed down

Habitat Type: creek/riparian, pond, mine portal, field edge, bottomland forest, cave entrance, bridge, open field, upland forest, structure, other

If collecting data on paper, please add site diagram to back.

**Daily Survey Data**

Sampling Night # \_\_\_\_\_ Survey Date \_\_\_\_\_

Y N

- ☐ ☐ Microphone operating normally
- ☐ ☐ Other unit operations normal
- ☐ ☐ Nightly temperatures >50F for first 5 hours
- ☐ ☐ No fog/rain that exceeds 30 minutes or  
continues intermittently for first 5 hours
- ☐ ☐ Sustained wind speeds not >9mph for 30 min for first 5 hrs

Additional Survey Notes

**Daily Survey Data**

Sampling Night # \_\_\_\_\_ Survey Date \_\_\_\_\_

Y N

- ☐ ☐ Microphone operating normally
- ☐ ☐ Other unit operations normal
- ☐ ☐ Nightly temperatures >50F for first 5 hours
- ☐ ☐ No fog/rain that exceeds 30 minutes or  
continues intermittently for first 5 hours
- ☐ ☐ Sustained wind speeds not >9mph for 30 min for first 5 hrs

Additional Survey Notes

**Daily Survey Data**

Sampling Night # \_\_\_\_\_ Survey Date \_\_\_\_\_

Y N

- ☐ ☐ Microphone operating normally
- ☐ ☐ Other unit operations normal
- ☐ ☐ Nightly temperatures >50F for first 5 hours
- ☐ ☐ No fog/rain that exceeds 30 minutes or  
continues intermittently for first 5 hours
- ☐ ☐ Sustained wind speeds not >9mph for 30 min for first 5 hrs

Additional Survey Notes

**Daily Survey Data**

Sampling Night # \_\_\_\_\_ Survey Date \_\_\_\_\_

Y N

- ☐ ☐ Microphone operating normally
- ☐ ☐ Other unit operations normal
- ☐ ☐ Nightly temperatures >50F for first 5 hours
- ☐ ☐ No fog/rain that exceeds 30 minutes or  
continues intermittently for first 5 hours
- ☐ ☐ Sustained wind speeds not >9mph for 30 min for first 5 hrs

Additional Survey Notes

**Coarse Analysis**

Biologist Initials \_\_\_\_\_

Y N

- ☐ ☐ Bats recorded
- ☐ ☐ High frequency calls exist >35kHz

Additional Coarse Analysis Notes

**Automated Analysis**

Application Name \_\_\_\_\_ Version \_\_\_\_\_

Output File Name \_\_\_\_\_

Biologist Initials \_\_\_\_\_

Application Name \_\_\_\_\_ Version \_\_\_\_\_

Output File Name \_\_\_\_\_

Biologist Initials \_\_\_\_\_

Night #	# of Calls	MLE	Additional Automated Analysis Notes	Night #	# of Calls	MLE	Additional Automated Analysis Notes

## INDIANA BAT HABITAT ASSESSMENT DATASHEET

Project Name: \_\_\_\_\_ Date: \_\_\_\_\_

Township/Range/Section: \_\_\_\_\_

Lat Long/UTM/ Zone: \_\_\_\_\_ Surveyor: \_\_\_\_\_

## Brief Project Description

--

## Project Area

	Total Acres	Forest Acres		Open Acres
Project				
Proposed Tree Removal (ac)	Completely cleared	Partially cleared (will leave trees)	Preserve acres- no clearing	

## Vegetation Cover Types

Pre-Project	Post-Project

## Landscape within 5 mile radius

Flight corridors to other forested areas?

Describe Adjacent Properties (e.g. forested, grassland, commercial or residential development, water sources)

## Proximity to Public Land

What is the distance (mi.) from the project area to forested public lands (e.g., national or state forests, national or state parks, conservation areas, wildlife management areas)?

Use additional sheets to assess discrete habitat types at multiple sites in a project area

*Include a map depicting locations of sample sites if assessing discrete habitats at multiple sites in a project area*

*A single sheet can be used for multiple sample sites if habitat is the same*

**Sample Site Description**

Sample Site No.(s): \_\_\_\_\_

**Water Resources at Sample Site**

Stream Type (# and length)	Ephemeral	Intermittent	Perennial	Describe existing condition of water sources:
Pools/Ponds (# and size)	Open and accessible to bats?			
Wetlands (approx. ac.)	Permanent	Seasonal		

**Forest Resources at Sample Site**

Closure/Density	Canopy (> 50%)	Midstory (20-50%)	Understory (<20%)	1=1-10%, 2=11-20%, 3=21-40%, 4=41-60%, 5=61-80%, 6=81-100%
Dominant Species of Mature Trees				
% Trees w/ Exfoliating Bark				
Size Composition of Live Trees (%)	Small (3-8 in)	Med (9-15 in)	Large (>15 in)	
No. of Suitable Snags				

Standing dead trees with exfoliating bark, cracks, crevices, or hollows. Snags without these characteristics are not considered suitable.

IS THE HABITAT SUITABLE FOR INDIANA BATS? \_\_\_\_\_

**Additional Comments:**

Attach aerial photo of project site with all forested areas labeled and a general description of the habitat

**Photographic Documentation:** habitat shots at edge and interior from multiple locations; understory/midstory/canopy; examples of potential suitable snags and live trees; water sources

## **APPENDIX B Acoustic Detector Photographs**





**Wilmington 2 Detector Site:** View of detector set up and microphone orientation. The microphone is located at the top of the metal pole, approximately 3 m above vegetation height, angled horizontally to the ground and oriented west towards a railroad corridor under a bridge.

## **APPENDIX C Habitat Assessment**

## APPENDIX A: PHASE I HABITAT ASSESSMENTS

Use additional sheets to assess discrete habitat types at multiple sites in a project area.  
 Include a map depicting locations of sample sites if assessing discrete habitats at multiple sites in a project area.  
 A single sheet can be used for multiple sample sites if habitat is the same.

Sample Site Description	
Sample Site No.(s)	Wilmington 2

Water Resources at Sample Site			Describe existing condition of water sources	
Stream Type (# and length)	Ephemeral	Intermittent		Perennial
Pools/Ponds (# and size)	Open and accessible to bats?			
Wetlands (approx. ac.)	Permanent	Seasonal		

Forest Resources at Sample Site			
Closure/Density	Canopy (> 50%)	Midstory (20-50%)	Understory (< 20%)
	70	60	70
Dominant Species of Mature Trees	N. Red Oak, Red Maple, E. White Pine, Big-toothed Aspen		
% Trees w/ Exfoliating Bark	0	0	0
Size Composition of Live Trees (%)	Small (3-8 in)	Med (9-15 in)	Large (> 15 in)
	70	60	70
No. of Suitable Snags	0		

1=1-10%, 2=11-20%, 3=21-40%, 4=41-60%, 5=61-80%, 6=81-100%

Standing dead trees with exfoliating bark, cracks, crevices, or hollows. Snags without these characteristics are not considered suitable.

IS THE HABITAT SUITABLE FOR INDIANA BATS? Yes

Additional Comments:

~~Detectors~~ Detector near bridge structure.  
 Underneath bridge structure may contain roosting habitat

Attach aerial photo of project site with all forested areas labeled and a general description of the habitat

Photographic Documentation: habitat shots on edge and interior from multiple locations; understory, midstory, canopy; examples of potential suitable snags and live trees; water sources

**APPENDIX D Resumes of Laura Berube and Trevor Peterson**

Dr. Peterson is a senior wildlife biologist and project manager specializing in renewable energy projects, bird and bat migration, and rare species assessments. He focuses on solutions to quantify and manage turbine-related wildlife impacts at terrestrial and offshore commercial wind projects. Since joining the company in 2003, Trevor's project experience has included a wide range of wide range of wildlife surveys at proposed and existing wind projects, rare bat surveys, breeding bird surveys, raptor surveys, nocturnal radar surveys, vernal pool water quality and ecological monitoring, rare turtle telemetry and demographic studies, natural community characterization, and vegetation monitoring. He earned his PhD in Ecology and Environmental Sciences from the University of Maine for his research on the use of long-term acoustic bat data to study bat migration and predict and manage potential impacts from land-based and offshore wind projects. Before working at Stantec, Trevor worked seasonally for the National Park Service at Acadia National Park and Isle Royale National Park and as an island caretaker for the Maine Island Trail Association. Dr. Peterson serves as Stantec's technical lead for acoustic bat surveys, responsible for updating equipment, survey methods, and data analysis/reporting methods.

## EDUCATION

PhD Ecology and Environmental Sciences , University of Maine, Orono, ME, 2020

McMillan Offshore Survival Training, Castine, Maine, 2016

AB, Biology/Environmental Studies, Summa cum Laude, Phi Beta Kappa, Bowdoin College, Brunswick, Maine, 2002

Semester Program in Costa Rica, Tropical Field Biology, Environmental Studies, and Spanish, Duke University, Durham, North Carolina, 2000

## CERTIFICATIONS & TRAINING

CPR, AED, and Basic First Aid, American Safety & Health Institute, Topsham, ME, 2019

Habitat Conservation Plan Training, US Fish and Wildlife Service National Conservation Training Center, Shepherdstown, WV, 2010

## MEMBERSHIPS

Member, Northeast Regional Migration Monitoring Network

Member, Northeast Bat Working Group

Member, The Wildlife Society, Maine, May 2011-present

## PROJECT EXPERIENCE

### RENEWABLE ENERGY, OFFSHORE

Block Island Offshore Wind Farm | Block Island, Rhode Island | 2018-Present | Senior Scientist

Regional Offshore Acoustic Bat Monitoring | Gulf of Maine, mid-Atlantic, Great lakes

Tracking Bats using Nanotag Telemetry in the Gulf of Maine

### RENEWABLE ENERGY

Activity-based Informed Curtailment: Using Acoustics to Design and Validate Smart Curtailment at Wind Farms | 2019 - 2022 | Principal Investigator

Avian and Bat Surveys at New Creek Wind Energy Project | Grant County, West Virginia

Avian and Bat Surveys at Laurel Mountain Wind Energy Project | Randolph and Barbour Counties, West Virginia

### NATURAL RESOURCE SERVICES

Natural Community Surveys and Resource Inventory | Moosehead Lake Region, Maine

Spotted Turtle and Vernal Pool Monitoring on Greenbush Railroad | Southeastern Massachusetts

Indiana Bat and Rare Bird Surveys at Proposed Wind Energy Project | Jefferson and Oswego Counties, New York

Acoustic Bat Surveys: Proposed Road Corridors | Tennessee

## PUBLICATIONS

Peterson, T.. *Predicting and managing risk to bats at commercial wind farms using acoustics. A dissertation submitted in partial fulfillment of the requirements for the degree of doctor of philosophy, University of Maine.*, 2020.

Pelletier, S.K., K.S. Omland, K.S. Watrous and T.S. Peterson, Information synthesis on the potential for bat interactions with offshore wind facilities - final report. *US Department of the Interior, Bureau of Ocean Energy Management, Headquarters. Herndon, Virginia. OCS Study BOEM 2013-01163. 119 pp.* 2013.

Hildt, S. and T. Peterson. Surveying the damage: tools and techniques. *Invited Presentation at the NRDA Short Course, University of Massachusetts*, 2014.

Peterson, T.S., S.K. Pelletier, S.A. Boyden, and K.S. Watrous. Offshore acoustic monitoring of bats in the Gulf of Maine. *Northeastern Naturalist* 21(1): 86-107, 2014.

Johnson, J.S., L.E. Dodd, J.D. Kiser, T.S. Peterson, and K.S. Watrous. Food Habits of *Myotis leibii* along a Forested Ridgetop in West Virginia. *Northeastern Naturalist* 19(4): 665-672, 2012.

Johnson, J.S., K.S. Watrous, G.J. Giumarro, T.S. Peterson, S.A. Boyden, and M.J. Lacki. Seasonal and geographic trends in acoustic detection of tree-roosting bats. *Acta Chiropterologica*, 13(1): 157-168, 2011.

Peterson, T.S., A. Uesugi, and J. Lichter. Tree recruitment limitation by introduced snowshoe hares, *Lepus americanus*, on Kent Island, New Brunswick. *Canadian Field Naturalist* 119 (4). 569-572, 2005.





## Laura Berube

Project Scientist

Laura is a Project Scientist for projects involving avian studies for pre- and post-construction projects in the Northeastern United States. Laura is a wildlife biologist with strong bird identification skills and the ability to identify bird species by both sight and sound. She has recently performed diverse avian studies for a number of renewable energy projects in the Northeastern United States, with field work including visual raptor surveys, eagle point count surveys, nocturnal migrant radar surveys, breeding bird surveys, and acoustic bat surveys. Laura is proficient in data management, analysis, summary, and vigorous QAQC for a variety of avian wildlife surveys. Laura is also proficient in acoustic bat analysis including the use of automated analysis programs: Kaleidoscope, BCID, EchoClass, and Sonobat.

Laura is also responsible for conducting vernal pool surveys and natural resource assessments and supporting wetland delineations to assist with the preparation of local, state, and federal permit applications. She has worked on a variety of natural community and rare plant surveys and projects ranging from general reconnaissance observations to quantitative community- and species-specific surveys. These projects have involved natural community mapping and analysis for transportation projects, utility corridors, and development sites.

### PROFESSIONAL EXPERIENCE

- Stantec Consulting. 2010-present. Project Scientist.
- University of Maine. 2009. Wildlife Department Field Assistant.

### EDUCATION

Bachelor of Science, Wildlife Ecology, University of Maine, Orono, Maine, 2010

Bat Conservation and Management - Acoustic Data Management Workshop, Bat Survey Solutions, LLC - Janet Tyburec and John Chengler, Fairfield, Maine, 2015

Wilderness First Aid Certified, SOLO, Topsham, Maine, 2014

40-Hour HAZWOPER Certification, Topsham, Maine, 2014

OSHA 10-Hour Construction Certification, ClickSafety, Topsham, Maine, 2012

### MEMBERSHIPS

Secretary/Treasurer, 2014-2019, The Wildlife Society, Maine

### PROJECT EXPERIENCE

#### NATURAL RESOURCE SERVICES

Post-construction Avian Fatality Monitoring at a Developed Wind Project | New Hampshire | Project Manager

Project Manager of the post-construction monitoring survey conducted at a developed wind project in New Hampshire. Responsible for client and agency communication, managing of field staff and field survey completion, and the completion of final reports and delivery to client and applicable state and federal natural resource agencies to assist with the compliance of the permit.

#### Ichthyoplankton Sampling | Field Technician

Assisted in ichthyoplankton field sampling to characterize the marine egg and larvae community present and potentially susceptible to impingement and entrainment at the cooling water intake structure of a facility withdrawing cooling water from Penobscot Bay, in support of the Clean Water Act 316(b) for a confidential client. The results of the sampling will be included in 316b report and would be used to inform the design of the impingement control system to be eventually installed.

#### Proposed Wind Project | Maine | Project Manager

Project Manager for proposed wind project requiring pre-construction avian and wildlife surveys. Responsible for client and agency communication, managing of field staff and field survey completion, and the completion of final reports and delivery to client to assist with their project planning and permit applications in compliance with applicable state and federal natural resource regulations.

#### Proposed Solar and Infrastructure Update Projects | Vermont | Project Manager

Wrote the proposals and was Project Manager for proposed projects requiring northern long-eared bat (*Myotis septentrionalis*) surveys. Responsible for client and agency communication, managing of field staff and field survey completion, and the completion of final reports and delivery to client to assist with their project planning and permit applications in compliance with applicable state and federal natural resource regulations.

#### Proposed Wind Projects | Maine | Task Manager

Responsible for the staffing and scheduling of field surveys including visual raptor surveys, eagle point count surveys, breeding bird surveys, and acoustic bat surveys. Also responsible for task managing the completion of

sections of the final reports to be delivered to clients to assist with their project planning and permit applications in compliance with applicable state and federal natural resource regulations.

**Orangeville, Marsh Hill, and Sheldon Wind Projects, Post-Construction Monitoring | Western New York | Technician Supervisor**

Supervised four post-construction monitoring technicians. Responsible for timecard and expense approval, tracking completion of safety trainings, and communicating with staff about needs while in the field.

**Proposed Wind Project, Down East Maine**

Conducted pre-construction wind project development surveys and impact assessments for a proposed wind project in Maine. These assessments included raptor surveys, eagle point count surveys, acoustic bat surveys, nocturnal radar surveys, and breeding bird surveys. Analyzed and reported on data for reporting purposes related to impact assessment and permitting efforts.

**Agency Meeting and Site Visit for Proposed Wind Project, Down East Maine**

Attended a pre-application agency consultation meeting for a proposed wind project in Down East Maine. Attended a site visit at proposed project area with client and agency representatives. Provided information on pre-construction wildlife field surveys conducted by Stantec at proposed wind project.

**Rollins Wind Project Invasive Species Monitoring | Lincoln, Maine**

Conducted invasive species surveys along a recently constructed transmission line right-of-way according to the standards and methods developed in the Invasive Species Management Plan.

**Schedule Coordinator | Topsham, Maine**

**Proposed Linear Project | New Brunswick, Canada**

Conducted surveys for rare, threatened, and endangered species of plants and wildlife, assessments of existing wildlife habitat values, and mapping of wetland and stream resources.

**Proposed Wind Project, Western New York**

Conducted eagle point count surveys to determine eagle locations and behavior in relation to proposed wind turbines. Assisted in survey design, mapping, and implementation. Performed quality assurance and control on data to inform potential collision risk of eagles as a result of the project.

**Bull Hill Wind Farm Post-Construction Monitoring, Maine**

Conducted bird and bat mortality ground searches (a requirement of utility-scale wind power developments in Maine). Responsible for scavenger surveys, which involved the placement and monitoring of carcasses and use of game cameras. Responsible for searcher efficiency trials, which involved the placement and monitoring of carcass retrieval by other surveyors.

**Groton Wind Farm, Raptor Surveys, Breeding Bird Surveys, Nocturnal Migrant Radar Surveys | Grafton County, New Hampshire | Task Manager**

Responsible for the staffing and scheduling of field surveys. Also responsible for task managing the completion of sections of the final report to be delivered to the client. Conducted raptor, breeding bird, and nocturnal migrant radar surveys. Analyzed data for reporting purposes related to impact assessment and permitting efforts.

**Record Hill Wind Farm Raptor Surveys, Roxbury, Maine**

Conducted raptor surveys to determine species, locations, and behavior in relation to proposed wind turbines. Analyzed data for reporting purposes related to impact assessment and permitting efforts.

**Rollins Wind Farm Post-Construction Mortality Monitoring and Raptor Surveys, Maine**

Conducted bird and bat mortality ground searches (a requirement of utility-scale wind power developments in Maine). Evaluated as having high searcher efficiency scores for the on-the-ground trials. Responsible for scavenger surveys, which involved the placement and monitoring of carcasses and use of game cameras. Also conducted raptor surveys to determine species, locations, and behavior in relation to proposed wind turbines. Analyzed data for reporting purposes related to impact assessment and permitting efforts.

**Proposed Wind Project Bird and Bat Surveys, Coye Hill, Connecticut**

Conducted pre-construction wind project development surveys and impact assessments for a proposed wind project in Connecticut. These assessments included raptor surveys, acoustic bat surveys, and breeding bird surveys.

**Eastern Box Turtle Protection Plan and Construction, Brewster, Massachusetts**

Conducted regular fence inspection in accordance with and NHESP-approved Eastern Box Turtle Protection Plan designed to protect box turtles in compliance with MESA during construction of a pump station development project. Responsible for documenting the presence of any box turtles in the vicinity of the fencing and reporting deficiencies in the fencing to appropriate personnel.

**Stetson I and II Wind Farms Post-Construction Monitoring, Maine**

Conducted bird and bat mortality ground searches (a requirement of utility-scale wind power developments in Maine). Evaluated as having high searcher efficiency scores for the on-the-ground trials. Responsible for scavenger surveys, which involved the placement and monitoring of carcasses and use of game cameras.

**Oakfield Wind Project Avian Studies | Maine**

Conducted raptor surveys to determine species, locations, and behavior in relation to proposed wind turbines. Analyzed data for reporting purposes related to impact assessment and permitting efforts.



## **Ecological Characterizations | Coos County, New Hampshire**

Conducted surveys for rare, threatened, and endangered species of plants and wildlife, assessments of existing wildlife habitat values, and mapping of wetland and stream resources in a remote area of New Hampshire.

### **Data Manager | Topsham, Maine**

Responsible for managing data related to bird and bat studies conducted by the office. Responsible for the retrieval, and placement of data to assist in effective report writing and limiting of possible liability.

### **Hand Analysis of Bat Data | Topsham, Maine**

Conducted analysis of bat detector data to determine species of bats for multiple project sites. Analysis results were then provided to clients to assist with their project planning and permit applications in compliance with applicable local, state, and federal natural resource regulations.

### **Automated Program Analysis of Bat Data | Topsham, Maine**

Conducted analysis of bat detector data using Kaleidoscope, BCID, and Sonabat software to determine species of bats for multiple project sites. Analysis results were provided to clients to assist with their project planning and permit applications in compliance with applicable state and federal natural resource regulations.

### **Wind Project | Eastern Maine**

Project scientist responsible for organization, progress, and safety of field staff through the field work phase (wetland delineations, vernal pool surveys, and other natural resource mapping) of large-scale wind power development. Responsible for data management and associated reporting of findings to accompany state and federal permit applications.

### **Beech Hill Wind Project | Aroostook County, Maine**

Assisted in wetland delineations, vernal pool surveys, and Global Positioning System surveys for a proposed 34-turbine wind project and associated 67-mile transmission line. Identified streams and Wetlands of Special Significance based on the criteria in the Maine Department of Environmental Protection's Natural Resource Protection Act. Characterized wetland and waterbody resources based the U.S. Fish and Wildlife Service Classification of Wetlands and Deep Water Habitats of the United States (Cowardin et. al 1979). Documented the biological and physical characteristics of potential vernal pool habitat based on the criteria of the Maine Department of Inland Fisheries and Wildlife.

### **Proposed Wind Project | Northern California**

Analyzed crepuscular radar data targeting federally threatened and state endangered marbled murrelets (*Brachyramphus marmoratus*) and reviewed and managed acoustic bat survey data for reporting purposes related to impact assessment and permitting efforts.

### **Proposed Wind Project | Central Maine**

Conducted wetland delineations, vernal pool surveys, and Global Positioning System surveys over an area

totaling approximately 6,800 acres for a proposed 55-turbine wind project in Central Maine. Determined wetland boundaries using the technical criteria described in the U.S. Army Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987). Identified streams and Wetlands of Special Significance based on the criteria in the Maine Department of Environmental Protection's Natural Resource Protection Act. Characterized wetland and waterbody resources based the U.S. Fish and Wildlife Service Classification of Wetlands and Deep Water Habitats of the United States (Cowardin et. al 1979). Documented the biological and physical characteristics of potential vernal pool habitat based on the criteria of the Maine Department of Inland Fisheries and Wildlife.

### **Block Island Wind Farm, Offshore | Rhode Island**

Conducted analysis of bat detector data using Kaleidoscope software and provided quality review of bat call determinations by the software to determine species of bats. Analysis results were provided to the client to assist with the project's compliance of applicable state and federal natural resource regulations.

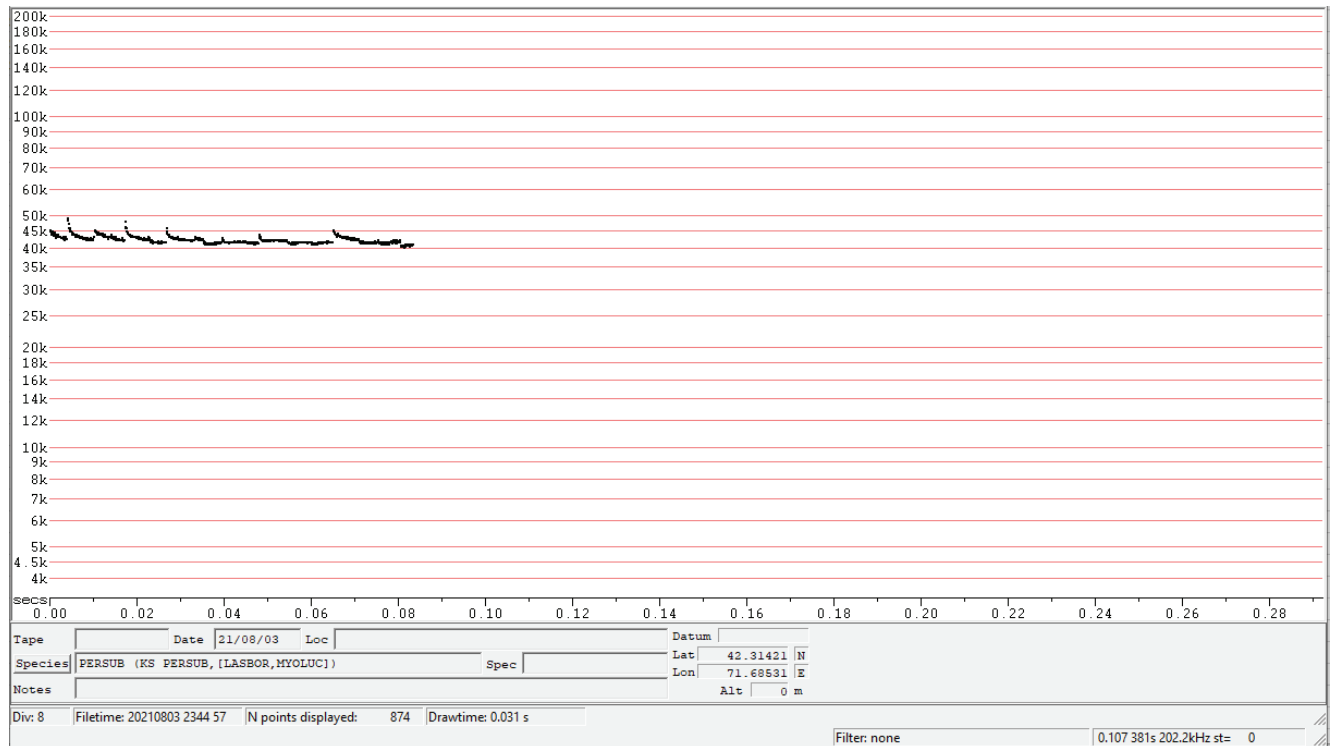
### **Natural Resource Advisory Role in Oil Spill Response | Large Interstate Oil Spill in Gulf of Mexico | Natural Resource Advisor**

Natural Resource Advisor (NRA) conducting environmental oversight of oil spill cleanup activities in compliance with an emergency consultation under Section 7 of the Endangered Species Act. NRAs worked directly with operational cleanup crews to implement Best Management Practices (BMPs). These BMPs served as the formal technical guidance issued under the emergency consultation. The objective of this work was to minimize secondary impacts of the cleanup activities on protected resources, including sea turtles, migratory and nesting shorebirds, beach mice, mangrove wetlands, estuaries, coastal wetlands, and dune systems. Implemented BMPs and conducted surveys for piping plover and sea turtles within designated critical habitats. Conducted training and oversight of cleanup crews and prepared daily reports documenting NRA activities. Worked closely with cleanup operations to provide education on BMPs and documenting daily compliance for use in USFWS consultation process and evaluation of secondary impacts to protected resources as part of the Natural Resources Damage Assessment (NRDA).

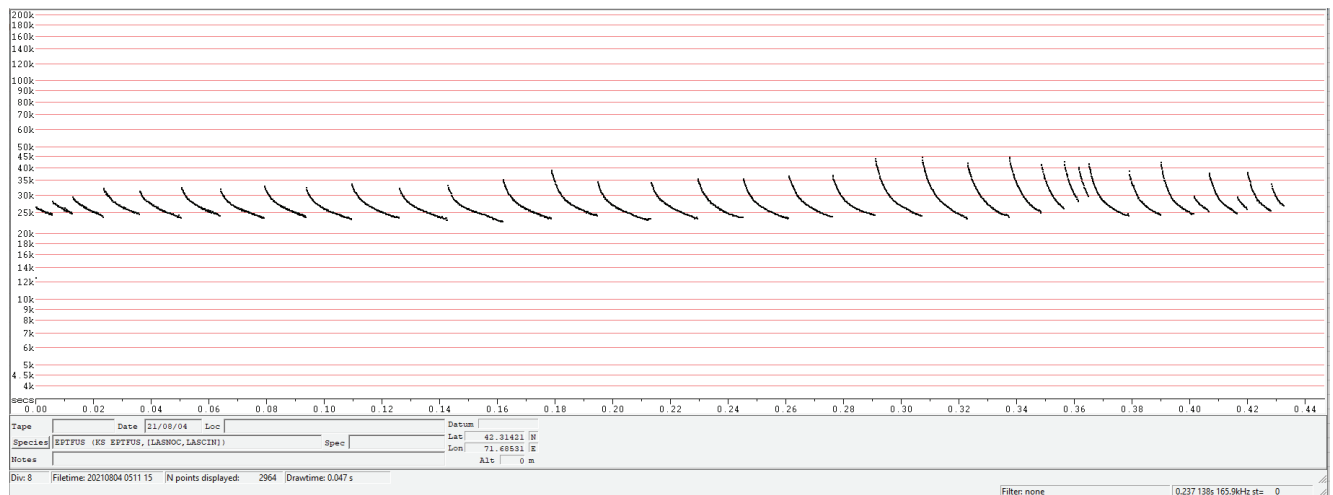
### **Proposed Wind Project, Offshore | Northeast and Mid-Atlantic US**

Conducted analysis of bat detector data using Kaleidoscope software and provided quality review of bat call determinations by the software to determine species of bats. Analysis results were provided to the client to assist with planning and permit applications in compliance with applicable state and federal natural resource regulations.

## **APPENDIX E Screenshots of Bat Passes**



Appendix E. Figure 1. Screenshot of a tricolored bat pass recorded on August 3, 2021.



Appendix E. Figure 2. Screenshot of a big brown bat pass recorded on August 3, 2021.

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